

I claim:

1. A method of compressing a current image of a sequence of images, the method comprising the steps of:
 - 5 (a) transforming the current image with a predetermined transform to provide a set of transform coefficients;
 - (b) retrieving, for at least one transform coefficient of the current image, one or more, but not all, bits of a corresponding transform coefficient of a previously compressed image of the sequence, wherein the corresponding transform coefficient is
10 truncated at a truncation bitplane and the retrieved bits comprise the least significant bit of the truncated corresponding transform coefficient;
 - (c) setting the at least one transform coefficient of the current image to a new value that is a function of the retrieved bits;
 - (d) storing one or more, but not all, bits of the at least one transform
15 coefficient for use in compressing one or more subsequent images of the sequence; and
 - (e) coding the transform coefficients of the current image to provide a compressed bitstream of the current image.
2. A method according to claim 1 wherein the number of retrieved bits is two bits.
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3. A method according to claim 2 wherein the step of setting the transform coefficient of the current image to a new value is only performed if a predetermined criterion is satisfied, the criterion depending on the truncation bitplane of the corresponding transform coefficient of the previous image.
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4. A method according to claim 3 wherein the predetermined criterion is:
$$(Q[\lfloor C^n \rfloor, L(n-1)] == 0 \ \&\& \ Q[\lfloor C^n \rfloor, L(n-1)+1] != 0 \ \&\& \ c_{L(n-1)}^{n-1} == 1) \parallel$$
$$Q[\lfloor C^n \rfloor, L(n-1)] > 0,$$

where C^n is the transform coefficient of the current image n , $L(n-1)$ is the truncation bitplane of the previous image $(n-1)$ and $c_{L(n-1)}^{n-1}$ is the least significant bit of the retrieved bits.

- 5 5. A method according to claim 4 wherein the predetermined criterion further comprises one or more conditions selected from the set consisting of:

$$\begin{aligned} Q[|C^n|, L(n-1)] &== 0 ; \\ Q[|C^n|, L(n-1)] &\neq \sum_{j=1}^L 2^{-j} ; \text{ and} \\ L(n-1) &== L(n-2). \end{aligned}$$

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6. A method according to claim 2 wherein the new value of the at least one transform coefficient is set by:

$$|C^n| = |C^n| + (c_{L(n-1)}^n - c_{L(n-1)}^{n-1}) * (2 * |c_{L(n-1)-1}^n - c_{L(n-1)-1}^{n-1}| - 1) * 2^{-L(n-1)}.$$

- 15 7. A method according to claim 1 wherein the predetermined transform is a discrete wavelet transform (DWT).

8. A method according to claim 1 wherein each image of the sequence is compressed substantially to the same predetermined rate.

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9. A method according to claim 1 wherein the compressed bitstream is substantially conformant with Motion JPEG2000.

10. A method according to claim 7 wherein the at least one transform coefficient is a
25 member of a subset of transform coefficients, wherein the subset is selected from the group consisting of:

- (i) all transform coefficients of the current image;

- (ii) all transform coefficients of predetermined Motion JPEG2000 code blocks;
- (iii) all transform coefficients in the level 1 subband; and
- (iv) all transform coefficients in the level 1, 2 and 3 subbands.

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11. A method according to claim 1 wherein, in said storing step, the bits of the transform coefficients of the current image are stored in a compressed form.

12. A method according to claim 1 wherein the truncation bitplane is a function of
10 sensor noise.

13. A method according to claim 1 wherein each image of the sequence is decompressible independently of the other images.

15 14. A method according to claim 1 wherein one bit is retrieved in said retrieving step.

15. A method according to claim 14 wherein the setting step comprises setting bit $L(n-1)$ of the at least one transform coefficient of the current image to the value of the retrieved bit if

20 $2^{L(n-1)} \leq |C| < 2^{L(n-1)+1}$ and the retrieved bit is zero, where $L(n-1)$ is the truncation bitplane of the previously compressed image and C is the at least one transform coefficient.

16. A method according to claim 15 wherein a significance of each coefficient is
25 stored for bitplane L between the coding of each frame in the sequence and is used to determine if $|P| < 2^L$.

17. A method according to claim 16 wherein the significances are compressed before storage.

18. A method according to claim 1 wherein the set of transform coefficients is
5 arranged in a set of blocks and the method further comprises the steps of:

determining truncation points of the blocks in the compressed bitstream of the current image, wherein a truncation point of at least one of the blocks of the current image is selected according to the current image and a truncation point selected for a corresponding block of one or more previous images, and

10 truncating the compressed bitstream of the current image at the determined truncation points to provide a further compressed representation of the current image.

19. A method according to claim 18, wherein associated with each block of the current image is a set of rate and distortion points, and wherein the step of determining
15 truncation points comprises the sub-step of:

determining the truncation points of the blocks of the current image that minimize a function of the distortion points while a function of the rate points satisfies a rate constraint.

20 20. A method according to claim 19 wherein the step of determining truncation points comprises the sub-step of:

weighting, for each block of the current image, a distortion value corresponding to the truncation point of the corresponding block in a previous image.

25 21. A method according to claim 19 wherein the step of determining truncation points comprises the sub-step of:

weighting, for each block of the current image, a rate value corresponding to the truncation point of the corresponding block in a previous image.

22. A method according to claim 1 wherein the method comprises the step of:
determining regions of a current image with respect to a previous image that
represent smooth areas near moving edges, and wherein, in the coding step, the transform
5 coefficients representative of the determined regions of the current image are encoded to
greater accuracy than the remaining transform coefficients.
23. A method according to claim 22 wherein the determination step of determining
regions of the current image representing smooth areas near moving edges is performed in
10 the spatial domain.
24. A method according to claim 23 wherein the determination step comprises the
sub-steps of:
a first filtering sub-step for filtering a moving edge map of corresponding blocks
15 of the current and previous images, wherein the first filtering sub-step is of a large spatial
extent;
a second filtering sub-step for filtering a moving edge map of corresponding
blocks of the current and previous images, wherein the second filtering sub-step is of a
small spatial extent; and
20 a determination step for determining a ratio of the first filtered moving edge map
and the second filtered moving edge map.
25. A method according to claim 22 wherein the predetermined transform is a discrete
wavelet transform (DWT) and the determination step of determining regions of the
25 current image representative of smooth areas near moving edges is performed in the
wavelet domain.

- 26 A method according to claim 25 wherein the determination step comprises the sub-step of generating a plurality of masks for respective blocks of the DWT coefficients of the current image for excluding predominantly similar DWT coefficients in a block from the bitstream.
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27. A method according to claim 18, comprising the step of:
- determining regions of a current image with respect to a previous image that represent smooth areas near moving edges, and wherein, in the coding step, the transform coefficients representative of the determined regions of the current image are encoded to
- 10 greater accuracy than the remaining transform coefficients.
28. A method of decompressing a compressed bitstream representative of a sequence of images, wherein the method comprises the steps of:
- decoding the compressed bitstream to provide transform coefficients of a current
- 15 image in the sequence;
- retrieving, for at least one transform coefficient of the current image, one or more, but not all, bits of a corresponding transform coefficient of a previously decompressed image in the sequence;
- setting the at least one transform coefficient of the current image to a new value
- 20 that is a function of the retrieved bits; and
- inverse transforming the current image with a predetermined inverse transform.
29. A method according to claim 28 wherein one bit is retrieved in said retrieving step.
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30. A method according to claim 28 wherein two bits are retrieved in said retrieving step.

31. An apparatus for compressing a current image of a sequence of images, comprising:

- (a) means adapted to transform the current image with a predetermined transform to provide a set of transform coefficients;
- 5 (b) means adapted to retrieve, for at least one transform coefficient of the current image, one or more, but not all, bits of a corresponding transform coefficient of a previously compressed image of the sequence, wherein the corresponding transform coefficient is truncated at a truncation bitplane and the retrieved bits comprise the least significant bit of the truncated corresponding transform coefficient;
- 10 (c) means adapted to set the at least one transform coefficient of the current image to a new value that is a function of the retrieved bits;
- (d) means adapted to store one or more, but not all, bits of the at least one transform coefficient for use in compressing one or more subsequent images of the sequence; and
- 15 (e) means adapted to code the transform coefficients of the current image to provide a compressed bitstream of the current image.

32. A computer program product comprising machine-readable program code recorded on a machine-readable recording medium, for controlling the operation of a data processing apparatus on which the program code executes to perform a method of
20 compressing a current image of a sequence of images, the method comprising the steps of:

- (a) transforming the current image with a predetermined transform to provide a set of transform coefficients;
- 25 (b) retrieving, for at least one transform coefficient of the current image, one or more, but not all, bits of a corresponding transform coefficient of a previously compressed image of the sequence, wherein the corresponding transform coefficient is

- truncated at a truncation bitplane and the retrieved bits comprise the least significant bit of the truncated corresponding transform coefficient;
- (c) setting the at least one transform coefficient of the current image to a new value that is a function of the retrieved bits;
 - 5 (d) storing one or more, but not all, bits of the at least one transform coefficient for use in compressing one or more subsequent images of the sequence; and
 - (e) coding the transform coefficients of the current image to provide a compressed bitstream of the current image.
- 10 33. A compressed sequence of images wherein at least one image is compressed using the methods of any one of claims 1 to 27.